

# **Cassini Radio Science Design Team Meeting: Ground System Developments**

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**Mark Gatti**

**June 2000**

TELECOMMUNICATIONS AND MISSION OPERATIONS  
**Cassini Radio Science Ground System**  
**Programmatic Issues**



- **Budget**
  - The PEM has been directed to plan budgets at levels that were previously agreed as acceptable.
  - **Concerns:**
    - Construction of facility to house the FTS equipment at DSS-25 is delayed
    - Exciter Software delivery planned for November delivery. Software team needs Exciter hardware to perform tests which will delay delivery of entire exciter system.
  - **Current Status**
    - Making requests for DSS-25 scheduled downtime to install front-end equipment
    - Planning workarounds for delivery of FTS equipment while awaiting facility construction approval
    - Current status: Green
- **Schedule**
  - All tasks on or ahead of schedule with the exception of the exciter.
  - Exciter delivery expected in November 2000; two month delay. Plans have been made to still deliver on schedule in 2001.

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# **Cassini Radio Science Ground System**

## **Significant Developments: Exciter and Monopulse**



- **Exciter**
  - All hardware modules for the X- to Ka-band Wideband Translator (WBX2KA) have been completed. The IF section is in test. All other modules are being assembled into the drawer.
  - A negotiated solution to the funding of the exciter has been reached between the PEM and the exciter CDE. The exciter will be delivered in the first quarter of FY01.
- **Monopulse Demonstration**
  - An operational readiness review was held in April.
    - Attended by station personnel
    - To review current state of monopulse and to inform station ops of future operational issues
  - The monopulse demonstration is currently ongoing at DSS-26 (a sister station to DSS-25)
  - Using Ka-band signal from the Cassini spacecraft
  - Initial success indicates that a blind pointing error of 5 mdeg has been corrected and reduced to within 0.7 mdeg
  - Further testing continuing

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## **Significant Developments: Aberration**



- **Aberration**
  - **A final aberration characterization was done in April 2000 at DSS-25.**
    - Identified precise locations of the feed position in the pedestal room with respect to north,
    - Set the amount and direction of motion required to obtain the expected antenna beam motion
    - Determined accuracy that could be attained
    - Demonstrated the entire end-to-end aberration technique.
  - **Tests identified that the mirror above the transmitter feed is too small.**
    - Originally designed for fixed feed
    - Aberration motion of feed causes excess spillover.
    - Mirror will be replaced by a larger one to be fabricated in the summer
- **Aberration/shroud Interface**
  - **A peer review of this design was held in May.**
    - The bellows design proved to be intractable. Too many problems to be solved at one time; e.g., noise abatement, mechanical stress, coupling, minimum time to replace front-end, etc.
    - A back-up was presented in the peer review. Extend the shroud completely around the Ka-band downlink and uplink feeds, i.e., three walls around the equipment connected to the shroud.
      - This option is being actively pursued. Design, drawings, costs, etc.
    - RF shielding cloth is also being investigated.

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## **Significant Developments: RSR and FTS**



- **Radio Science Receiver (RSR)**
  - Funding for the IF switches required for the overseas sites has been made available. The receiver team has begun the design and procurement of these items. The first working version should be available in late June.
  - The first RSR rack has been delivered to Goldstone for testing. The RSR will support Radio Science experiments in May 2000.
  
- **FTS**
  - The construction of the facility to house the sensitive equipment has been delayed.
  - Congressional regulations on NASA require specific approval of construction of facility (C of F) by the NASA comptroller. Approval has been delayed awaiting Code-S submittal of its Operating Change Plan.
  - All bids are in from contractors and a contractor selected. This contractor has extended his bid to 20 June 2000.
  - All appropriate NASA codes have been made aware of this delay.
  - The technical team is devising a workaround to deliver the hardware for functional operation. Specific stability requirements will not be met until the completion of the building construction.

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## **Significant Developments: Media Cal and Transmitter**



- **Media Calibration**
  - End-to-end autonomous data acquisition, processing and display was demonstrated.
    - Software located on computer at JPL
    - Collects data from media cal instruments, calibrates, interpolates, converts to path delays, and displays in “real time” (up to 15 minute delay).
  - Inter-comparisons between AWVR and connected element interferometer (CEI) tests were supported.
    - Differential path delays for  $t < 1000$  sec show good agreement
    - Longer time periods show substantial deviation between AWVR and CEI. Current theory is that CEI is subject to thermal drifts over the longer time periods. (CEI work funded by TMOT Advanced Technology Program.)
- **Ka-band Transmitter**
  - A failure of the klystron tube occurred during tests or Allan Standard Deviation. ASD results looked within specification up to the failure which occurred 8 hours into test.
  - The tube was sent to manufacturer for repair. Both it and the spare will be repaired.
  - Expected redelivery of the tube is in June 2000.
  - No schedule impact. This system was originally delivered 2 months ahead of schedule.